How cannabis causes 'cognitive chaos' in the brain

October 25 2011

Cannabis use is associated with disturbances in concentration and memory. New research by neuroscientists at the University of Bristol, published in the *Journal of Neuroscience*, has found that brain activity becomes uncoordinated and inaccurate during these altered states of mind, leading to neurophysiological and behavioural impairments reminiscent of those seen in schizophrenia.

The collaborative study, led by Dr Matt Jones from the University's School of Physiology and Pharmacology, tested whether the detrimental effects of cannabis on memory and cognition could be the result of 'disorchestrated' brain networks.

Brain activity can be compared to performance of a philharmonic orchestra in which string, brass, woodwind and percussion sections are coupled together in rhythms dictated by the conductor. Similarly, specific structures in the brain tune in to one another at defined frequencies: their rhythmic activity gives rise to brain waves, and the tuning of these brain waves normally allows processing of information used to guide our behaviour.

Using state-of-the-art technology, the researchers measured electrical activity from hundreds of neurons in rats that were given a drug that mimics the psychoactive ingredient of marijuana. While the effects of the drug on individual brain regions were subtle, the drug completely disrupted co-ordinated brain waves across the hippocampus and prefrontal cortex, as though two sections of the orchestra were playing

out of synch.

Both these brain structures are essential for memory and decision-making and heavily implicated in the pathology of schizophrenia.

The results from the study show that as a consequence of this decoupling of hippocampus and prefrontal cortex, the rats became unable to make accurate decisions when navigating around a maze.

Dr Jones, lead author and MRC Senior Non-clinical Fellow at the University, said: "Marijuana abuse is common among sufferers of schizophrenia and recent studies have shown that the psychoactive ingredient of marijuana can induce some symptoms of schizophrenia in healthy volunteers. These findings are therefore important for our understanding of psychiatric diseases, which may arise as a consequence of 'disorchestrated brains' and could be treated by re-tuning brain activity."

Michal Kucewicz, first author on the study, added: "These results are an important step forward in our understanding of how rhythmic activity in the brain underlies thought processes in health and disease."

Provided by University of Bristol